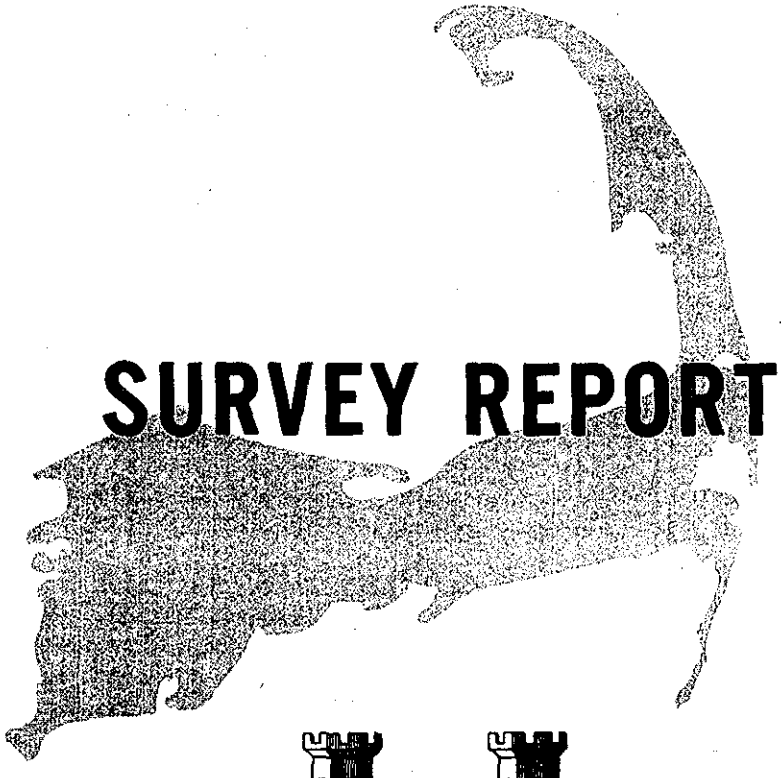
Division Eng.

NAUSET HARBOR

ORLEANS AND EASTHAM

MASSACHUSETTS



SURVEY REPORT

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

JUNE 1969

31

SURVEY REPORT

NAUSET HARBOR

ORLEANS AND EASTHAM
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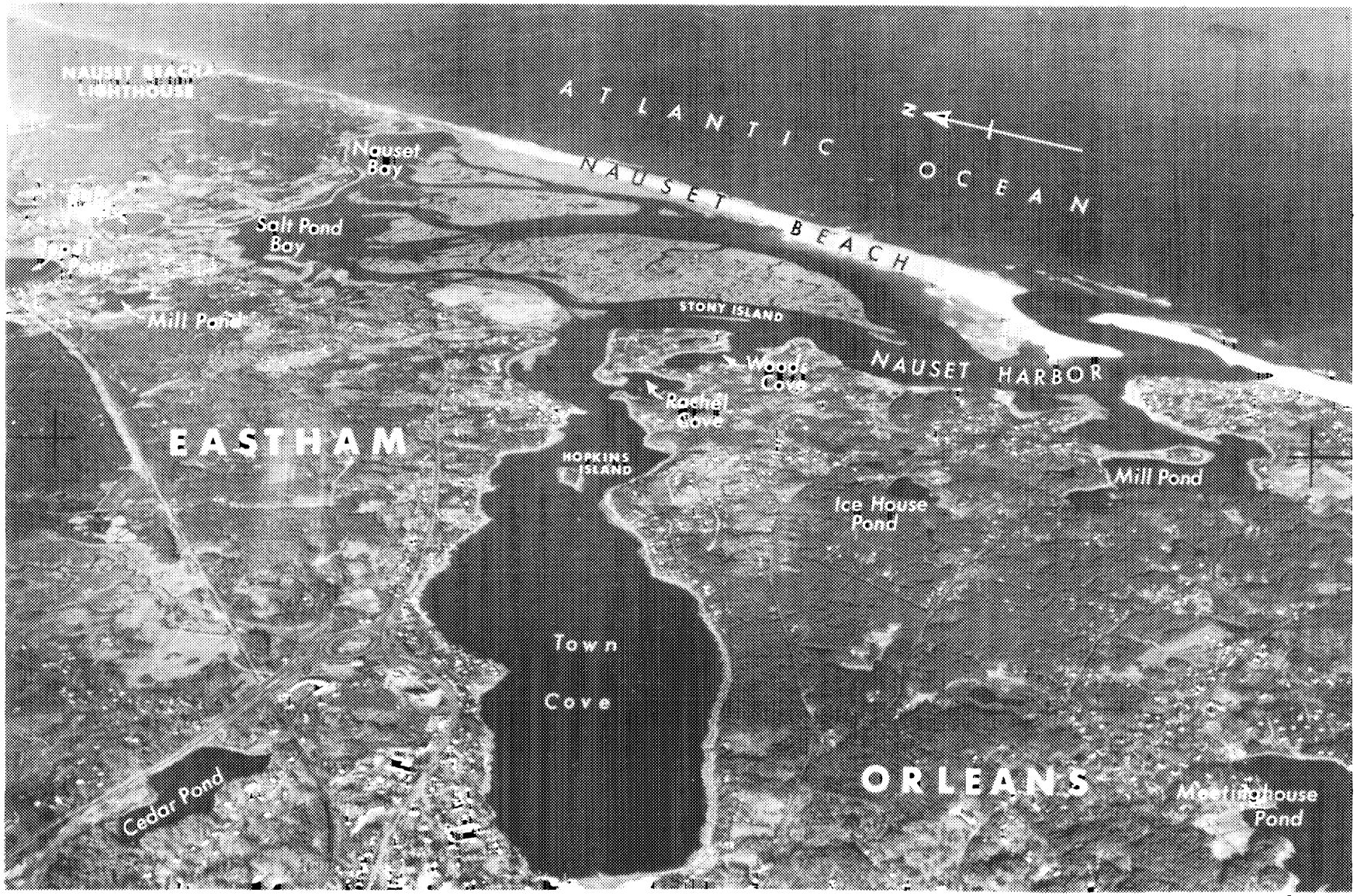

OBLIQUE VIEW OF NAUSET HARBOR AND CONNECTING WATERWAYS

Kelsey AIRVIEWS
68-1206-49

SYLLABUS

Nauset Harbor is located at the eastern extremity of the "forearm" of Cape Cod, in the Towns of Orleans and Eastham, Massachusetts. It is a natural tidal lagoon of 1,350 acres separated from the Atlantic Ocean by a 2-1/2-mile long barrier beach. A natural migrating inlet is located at the southerly end of the beach at Nauset Harbor. Shifting shoals and meandering natural channels in the entrance and throughout the harbor and adjacent waterways result in navigation difficulties for commercial and recreational craft.

The Division Engineer has studied the navigation problems in Nauset Harbor and has considered a plan of improvement to correct these problems. He finds that the benefits which would result from provision of the plan to provide a stabilized inlet with entrance and interior access channels and anchorage would be insufficient to justify the work. He, therefore, recommends no Federal navigation improvement in Nauset Harbor at this time.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

IN REPLY REFER TO:
NEDED-R

20 June 1969

SUBJECT: Survey of NAUSET HARBOR, Orleans and Eastham, Massachusetts

Chief of Engineers
ATTN: ENGCW-P

AUTHORITY

1. This report is submitted in compliance with Section 109 of the River and Harbor Act approved on 14 July 1960 (Title I, Public Law 86-645), which reads as follows:

> "Sec. 109. The Secretary of the Army is hereby authorized and directed to cause surveys to be made at the following named localities and subject to all applicable provisions of Section 110 of the River and Harbor Act of 1950, ... NAUSET HARBOR, Massachusetts....."

The Chief of Engineers assigned preparation of the report to the New England Division Engineer.

PURPOSE AND EXTENT OF STUDY

2. The study was made for the purpose of determining the advisability of constructing navigation improvements in Nauset Harbor, and connecting waters.

3. A public hearing was held on 15 August 1968 in Eastham, Massachusetts, to obtain information concerning the desires and need for improvements and to give people in the two communities an opportunity to present their views. The information obtained is described under "IMPROVEMENTS DESIRED," Paragraph 31. All Federal, State and local agencies having an interest in the improvements of the area have been consulted during the course of the study. Their views are included in the text or in APPENDIX B.

4. Combining this study with the Pleasant Bay Study, located in Orleans and Chatham, and providing a common inlet between both bodies of water was considered. However, automatic tide gauge recorders in each area indicated that the already complicated tidal hydraulic differences would be aggravated, especially in the upper reaches of Pleasant Bay. In addition, natural beach recession has reduced the width of beach and filled the waterway that connected Pleasant Bay and Nauset Harbor in 1854. A large, paved parking lot was later constructed over the filled area to accommodate patrons of the popular Orleans Town Beach. The narrowed beach and existing recreational beach now preclude construction of an adequate connecting navigation channel behind the barrier beach. In view of the above, separate studies were made.

5. Available charts, maps, hydrographic surveys, and other related reports of the area were utilized, as well as aerial photographs flown specifically for the study. Technical advice and assistance were provided by the Coastal Engineering Research Center, U. S. Weather Bureau, U. S. Coast and Geodetic Survey, U. S. Coast Guard, U. S. Public Health Service, the U. S. Fish and Wildlife Service and affiliates, the Cape Cod National Seashore, and the Federal Water Pollution Control Administration. Supplemental information concerning the littoral drift along the outer beach was obtained from the Woods Hole Oceanographic Wave Laboratory on Cape Cod.

6. State and town officials, local fishermen, and other interests have been consulted during the study, and the work has been coordinated and discussed with appropriate Federal and State agencies.

DESCRIPTION

7. Nauset Harbor is located in the towns of Orleans and Eastham, Massachusetts (Barnstable County), at the eastern extremity of the "forearm" of Cape Cod. It is a shallow, salt water lagoon, 1,350 acres in area, and includes Mill Pond, Town Cove, Salt Pond Bay, Salt Pond and Nauset Bay. It is bordered on the north and west by the town of Eastham, on the south by the town of Orleans, and on the east by the Atlantic Ocean. It is located 70 miles southeast of Boston, Massachusetts, and 230 miles east of New York City.

8. The lagoon is separated from the ocean by Nauset Beach, a low, bay mouth bar forming a sandy spit extending about 2-1/2 miles in a southerly direction from the mainland at Nauset Bay. The extreme southerly end of the spit is flat and of recent formation, and is almost completely devoid of sand dunes and indigenous beach grass. The northerly end is composed of irregularly shaped sand dunes, 10 to 15 feet high. The spit is nourished by littoral drift from the bluffs to the north. The width of the barrier beach varies from 500 to 1,500 feet. Another sandspit extends northerly from the Nauset Heights area in Orleans. This spit is believed to have been formed by deposition of sand bypassed across the inlet by tidal currents and has no significant sand dunes. The average width at the beach berm is about 400 feet.

9. Nauset Harbor Inlet lies between these two sandspits and is the only inlet on the eastern shore of Cape Cod between the Chatham Harbor inlet, which leads to Pleasant Bay, and Provincetown Harbor, 10 miles and 40 miles to the south and north, respectively. The entrance has an average depth of about 3 feet at low water in rapidly shifting, natural channels and is exposed to easterly winds and waves from the Atlantic Ocean. The area within the harbor is generally shoal throughout. Tide ranges within the area vary from 2.2 feet in Nauset Bay, 4.6 feet at the southern extremity of Town Cove, to 4.3 feet just inside Nauset Harbor. The mean tidal range in the Atlantic Ocean opposite the harbor is about 7.0 feet. Although the sandspits provide protection to the lagoon, numerous washovers show evidence that large amounts of sand are washed into the lagoon during storms. The locality is shown on U. S. Coast and Geodetic Survey Charts 1107 and 1208, and on the Orleans Quadrangle of the U. S. Geological Survey maps.

TRIBUTARY AREA

10. The town of Orleans was settled in 1693 and was first called Nauset. Early industries included agriculture, shellfishing, salt works, and shipping. Many windmills were used to pump water from the ocean to make salt and grind corn. The War of 1812 curtailed general commerce, but later additional salt works and cod fisheries developed. Agriculture slowly returned, aided by seaweed and horseshoe crabs used as fertilizers. A shirt and overall factory existed until about 1900.

11. Today, Orleans is largely dependent upon the tourist industry. Wholesale and retail trade form the economic base of the town, followed by the construction and the service industries. Orleans is the shopping center for that area of Cape Cod. Manufacturing firms in Orleans include two commercial printers, and one meat products company.

12. Eastham is chiefly a summer community, as are many of the other towns on Cape Cod. Nauset Beach, one of the chief tourist attractions, provides excellent surf bathing and surf fishing. The beach has also been the site of many sea disasters and the Federal Government erected the Nauset Lighthouse, about a mile north of Nauset Bay, in 1839. The lighthouse was rebuilt and moved 200 feet eastward in 1923 because of bluff erosion.

13. The population of the towns consists of permanent and summer residents, and summer visitors. Each of these population groups continues to increase.

14. Cape Cod can be reached by highway from the Boston, Providence, Hartford, New London, New Haven and New York areas. Train freight service is available to South Dennis, about 14 miles southwest of Nauset Harbor. Bus service is available to the area from Boston and Providence and connecting points to the north and west. Hyannis Municipal Airport is the Cape's major commercial field and is about 16 miles southwest of Nauset Harbor. Chatham Municipal Airport is located in the town of Chatham, about 8 miles south of Nauset Harbor.

15. The Cape Cod National Seashore was created along the outer Cape by an Act of Congress on 7 August 1961. It includes the Provincelands and the Great Cliffs as far south as Nauset Bay, covering about 20, 000 acres and a total shoreline of about 45 miles on the Atlantic Ocean. This national park is a natural recreation area within a day's journey for nearly one-third of the country's population. During 1968, 3, 476, 000 people visited the seashore. The National Seashore boundary is shown on PLATE I.

BRIDGES

16. There are no existing bridges in the area that would affect navigation or related improvements.

PRIOR REPORTS

17. There have been no prior reports on Nauset Harbor.

OTHER IMPROVEMENTS

18. The Commonwealth of Massachusetts dredged various navigation channels in the towns of Eastham, Orleans, and Chatham in 1924. The areas dredged in Nauset Harbor totaled about 1,400 lineal feet and were generally 60 feet wide and 6 feet deep.

19. In 1963, the Orleans Yacht Club constructed a permanent wooden pier and dredged 10,000 cubic yards of material from a 1-1/2-acre area in front of their club, to provide float room and boat access to deeper anchorage areas. Total cost of the work was about $7,000.

20. The town of Orleans constructed a wooden pier in 1967 at the southerly end of Town Cove. In the spring of 1968, about 1,000 cubic yards of material was removed from a 1-acre area in front of the pier. The material was placed on the backshore to provide a parking area. Total cost of the work was about $4,200.

21. In 1967, a 1-acre mooring area was dredged at Richardson's Landing, opposite Rachel Cove. The material was placed on a sandspit, located adjacent to and on the northerly side of the mooring area, and then inclosed by a 5-foot high rock rubble revetment structure. The work was performed by private interests and no costs are available.

22. There is a large, paved parking area at Hemingway's Landing. Limited improvements have been made at other public landings of the towns of Orleans and Eastham.

TERMINAL AND TRANSFER FACILITIES

23. There are two permanent wooden piers at the extreme southerly end of Town Cove. One is owned by the Orleans Yacht Club and is about 75 feet long, 5 feet wide, and is open only to members and guests. The town of Orleans owns the other pier, which is 96 feet long and 6 feet wide. There is a gravel ramp on the westerly side and a double

width asphalt ramp on the easterly side of the pier. Another wood pier and float, owned by the town of Orleans, is located at the town line on the west shore of Town Cove. It is 90 feet long and 4 feet wide. There is a 12-foot wide concrete launching ramp on the northerly side. The piers and ramps are open to all on equal terms. No fuel, electricity, or potable water are available.

24. A pier, float, and launching ramp are located adjacent to the westerly town pier which are owned by the Goose Hummocks Shop. It rents, sells, repairs, and stores boats on property across the street from the pier. The pier is 150 feet long, 4 feet wide, and has an 8-foot by 20-foot float at its outer end. There is a 15-foot wide concrete boat launching ramp on the southerly side of the pier. Seasonal moorings average about 35 per year. The maximum boat length is about 19 feet. Facilities are open only to customers.

25. The Collins Boat Livery is located on the west shore of Town Cove, about opposite the highway rotary. A small yacht club also occupies the area. Mooring space is limited due to extensive shoals and mudflats. Potable water is available and limited repairs can be made at the livery. A gravel launching ramp, adjacent to the yacht club, is owned by the town of Eastham and is open to all on equal terms.

26. A number of small, privately-owned piers are scattered along the shoreline of the study area. Town landings, boatyards, and other marine-related areas are shown on PLATE I. There are no major terminal or transfer facilities in the study area as there is no large scale commerce.

EXISTING AND PROSPECTIVE COMMERCE

27. The only waterborne commerce in Nauset Harbor is fish. About 25 local fishermen fish commercially throughout the harbor, primarily for lobster, cod, and other edible species of fish, as well as all kinds of shellfish. Many combine operations, as the season dictates. The amounts landed are expressed in pounds for lobsters and fish, and bushels for shellfish, as they are sold in those units. The breakdown is as follows:

a. Lobster. One full-time lobsterman has about 1, 000 pots, and he is reputed to be the largest wholesale dealer on the east coast south of Maine. He operates a 40-foot boat that draws 3-1/2 to 4 feet of water and tends 150 to 200 pots per day. About four other part-time lobstermen fish inside and outside Nauset Harbor during the summer months in 14- to 18-foot outboards. They usually handle about 20 pots each. About 15 other lobstermen operate on a part-time basis and have about 10 pots each. Two are located in Town Cove and two in Mill Cove. The others are located along the Nauset Harbor shoreline. During the summer there are usually over 100 lobster pots throughout the large marsh areas in the northerly section of the lagoon. Some of the pots are set by local residents who own one to five pots each. There are no actual figures available on the lobster catch; however, the rule of thumb is 1 pound per pot per day. In 1968, the commercial lobstermen averaged 35, 400 pot days and individuals averaged 4, 000 pot days for a total of 39, 400 pounds of lobster. The wholesale value was $24, 700. Almost all of the lobsters are sold to local restaurants and seafood markets throughout the local area by the individual fishermen, as there are no wholesale fish companies in Nauset Harbor.

b. Codfishing. There are no large commercial finfishing vessels operating out of Nauset Harbor. The Orleans harbormaster reports that, during the summer, about five fishermen navigate the precarious inlet in 16- to 18-foot outboards and fish the nearby Atlantic Ocean, primarily for cod and other edible species of fish. They fish full time when the weather is favorable and in 1968 they grossed about $3, 000 per man. Other part-time fishermen grossed another $5, 000 for an estimated total gross value of $20, 000. The gross catch was estimated to be about 166, 000 pounds.

c. Shellfishing. There are 6 to 8 full-time clam diggers in the Nauset Harbor area during the summer months. They average 2 bushels per day for about 100 days. In 1968, they dug about 1, 600 bushels, and residents and non-residents dug another 200 bushels, for a total of about 1, 800 bushels. The value of the catch was about $21, 600. Salt Pond is a popular shellfish area in Eastham, but no figures are available as to the amount of catch.

28. There is no commercial property available along the shores of Nauset Harbor on which to build needed wharves or piers. Local

fishermen presently unload their catch into small boats for transfer to the shore or land their boats directly on the beach. Since there are no commercial facilities available and without navigation improvements, it is unlikely that there will be any substantial increase in the present commerce.

29. During the summer months, surf-casting for striped bass is popular along the outer beaches. Town Cove and Nauset Harbor are excellent spots for flounder fishing and striped bass trolling.

VESSEL TRAFFIC

30. Vessel traffic through the tidal inlet is limited to commercial craft, a few recreational boats, and emergencies. The commercial trips are estimated to be around 900 per year and the remainder estimated to be another 100, for a total of 1,000 trips per year.

IMPROVEMENTS DESIRED

31. Improvements desired by officials of the towns of Orleans and Eastham, and by other local interests, were expressed at the public hearing on 15 August 1968. The primary improvements requested include:

a. A stabilized inlet channel, which would allow passage of small- and medium-sized boats, allow sufficient tidal flow to prevent stagnation and shoaling, and would lower increasing water temperature.

b. A navigation channel from the inlet into deep water of Town Cove, a minimum of 4 feet deep as a conservation measure, but preferably 6 feet deep and 100 feet wide; also, to prevent Town Cove from becoming stagnant and polluted.

c. Creation of a channel by Stony Island and alongshore up to, but not including Salt Pond, to stop shoaling and stagnation problems.

d. A navigation channel on the east side of Hopkins Island connecting to the main channel in Town Cove. Passage around the island would then be possible at all stages of the tide.

e. Placement of fill on the outer beach to protect the rapidly eroding dunes.

32. Local interests feel that, since their economy is based primarily on recreational aspects, improvements in Nauset Harbor and Town Cove would expand boating activity in private, charter, and party fishing boats, as well as provide a potential for larger, deep sea sportfishing boats. A stabilized inlet would make the entrance usable under all weather conditions and the harbor could serve as a refuge during storms. They believe that navigation channel improvements would encourage marina development and sustain marine nurseries in the wetlands of the Nauset and Salt Pond Bay areas.

DIFFICULTIES ATTENDING NAVIGATION

33. The existing inlet is hazardous to general navigation as it shoals and changes location seasonally and with almost every change in tide. It is exposed to the Atlantic Ocean where 25- to 30-foot waves are occasionally generated. At least one gale with winds over 32 miles per hour can be expected each year, raising tide levels and producing waves that pound the coast and overtop the low-lying barrier beach. Large quantities of sand from the beaches are carried into the lagoon, shoaling natural channels, covering shellfish beds and large marsh areas which are essential to the perpetuation of marine fisheries in the area.

34. Since 1924, extensive shoaling has occurred inside and outside the inlet, making passage difficult and dangerous, and sometimes impossible. Even on fair weather days, passage through the inlet is hazardous due to offshore generated waves breaking over the bar in the inlet. Many good fishing days are lost to most of the fishermen as only a few boatmen attempt to navigate the inlet. Extensive shoals have developed around Stony Island, Snow Point, in Salt Pond River, and into Town Cove. Congestion is also developing in the few naturally deep and accessible mooring areas. These navigation difficulties restrict full use of the harbor.

WATER POWER AND OTHER SPECIAL SUBJECTS

35. The waterway under study is tidal. There are no rivers or sizable streams that would create problems of power, flood control, or other related items.

SHORELINE CHANGES

36. The geomorphology of the Coastal Plain of Cape Cod indicates that the shoreline is continually changing. Rates of erosion of the great cliffs and beaches of outer Cape Cod average about 3 feet per year.

37. It has been estimated that the total amount of material eroded along the ocean side of the Cape is about 900,000 cubic yards per year. About 20 percent is lost offshore and 80 percent is left to make up the bars, spits, and beaches. Each year, 250,000 cubic yards of material move past the Nauset inlet. A considerable amount of sand is also lost from the barrier beach by wind action, overtopping by storms, and by the jet action of the tidal inlet. No figures are available as to the amount lost; however, it can be seen from aerial photographs that the sand is deposited in the lagoon, where it covers the marshes and shoals natural navigation channels.

PROJECT FORMULATION

38. In formulating the project, a minimum plan was considered which would satisfy local requirements while maximizing the overall future net benefits. The provision of navigation channels throughout the Nauset Harbor complex is also related to the provision of a safe access to the harbor and successful maintenance of the channels is dependent upon the integrity of the barrier beach.

PLAN OF IMPROVEMENT

39. Consideration of a plan of improvement entailed review of the specific desires of local interests, together with provision of elements that would preserve the existing marine environment and recreational aspects of the area and yet satisfy the needs of present and prospective boating.

40. The plan considered includes a new inlet through Nauset Beach, protected by two jetties; an entrance channel between the jetties and extending into Town Cove; a branch channel into Mill Pond; and branch channels in the Salt Pond River and along Hopkins Island, both terminating at small anchorage areas. The considered improvements are shown on PLATE I.

REQUIRED AIDS TO NAVIGATION

41. The standard navigation aids were estimated to cost $30, 000 with annual maintenance charges of about $10, 000.

ESTIMATE OF FIRST COSTS

42. The estimated first cost is based on the use of standard construction practices. The plan of improvement consists of several features and is estimated to cost $8, 100, 000 including $30, 000 for aids to navigation and $10, 000 for self-liquidating local public landings. The cost of each feature reflects price levels as of June 1969 and is as follows:

General Excavation,	35, 000 c. y. @ $0. 50		$ 18, 000
Dredging (New Inlet & Pre-Dredging Sand Trap)	496, 000 c. y. @ $1. 50		743, 000
Dredging Interior Channels	336, 000 c. y. @ $1. 25		421, 000
Rebuild Sand Dunes & Close Existing Inlet	782, 000 c. y. @ $0. 10		78, 000
Beach Grass Plantings	1, 400 M ea @ $25. 00		35, 000
Dispose of Unusable Material	25, 000 c. y. @ $1. 00		25, 000
Stone Jetties			
Sizes:			
0-1 Ton	72, 400 Tons @ $16. 00	$1, 160, 000	
1-10 Ton	62, 770 Tons @ $19. 00	1, 190, 000	
10-20 Ton	67, 200 Tons @ $24. 00	1, 620, 000	
20-25 Ton	26, 500 Tons @ $28. 00	740, 000	$4, 710, 000
		TOTAL	$6, 030, 000
Contingencies			$ 910, 000
			$6, 940, 000
Engineering and Design			580, 000
Supervision and Administration			540, 000
		TOTAL FIRST COST	$8, 060, 000 (1)
Aids to Navigation, U. S. Coast Guard (est.)			30, 000
			$8, 090, 000
Public Landings, two (self-liquidating)			10, 000
		TOTAL FEDERAL AND NON-FEDERAL COST	$8, 100, 000

(1) Exclusive of $23, 000 study costs.

ESTIMATE OF BENEFITS AND ANNUAL CHARGES

43. The general and recreational annual benefits attributable to the proposed plan of improvement would be about $120,600 and $110,700, respectively, for a total of $231,300. The benefits are itemized and further detailed in APPENDIX A. Annual charges are as follows:

Annual Charges

Interest and Amortization ($8,060,000 x 0.05163)	$416,000
Annual Maintenance	504,000
	$920,000
Aids to Navigation (I & A and maint., est.)	12,000
TOTAL ANNUAL CHARGES	$932,000

COMPARISON OF BENEFITS AND COSTS

44. Comparison of the estimated annual benefits of $231,300 to the estimated annual carrying charges of $932,000 results in a benefit-cost ratio of 0.2 to 1.0, indicating that the proposal is not economically justified.

COORDINATION WITH OTHER AGENCIES

45. All interested Federal, State, and local agencies were notified of the public hearing held in Eastham, Massachusetts on 15 August 1968.

DISCUSSION

46. Nauset Harbor is a shallow tidal lagoon located on the east shore of Cape Cod within the towns of Eastham and Orleans. The harbor entrance consists of a migrating inlet resulting from a combination of littoral drift, tidal action, and wave attack. The tributary towns are small communities whose economies are largely dependent upon the summer tourists. The terminal facilities are relatively few in number, the improvements for general navigation and shorefront needs have been moderate, and while commercial and recreational activities are increasing, they are also moderate at this time. Local interests desire a stabilized inlet, an entrance channel, and interior access channels and anchorage areas.

47. Because the harbor entrance is exposed to waves from the ocean, jetties of large cross-section would be required. The large amount of littoral drift materials would require a yearly sand bypassing program involving high costs. In addition, the costs of providing the entrance and interior channel and anchorages would be abnormally high because of the extensive shoal conditions. These total costs far exceed any benefits expected to accrue to the commercial fishing and recreational boating interests during the life of the considered project.

CONCLUSIONS

48. A controlled inlet from the Atlantic Ocean into Nauset Harbor, with interior channels, anchorages, and barrier beach dune restoration would result in some benefits to commercial fishing and recreational boating interests. In addition, intangible benefits would also accrue to the surf fisherman, picnicker, sightseer, and the complementary service interests. However, the cost of a minimum plan of improvement far exceeds anticipated benefits and the project is not economically justified at this time.

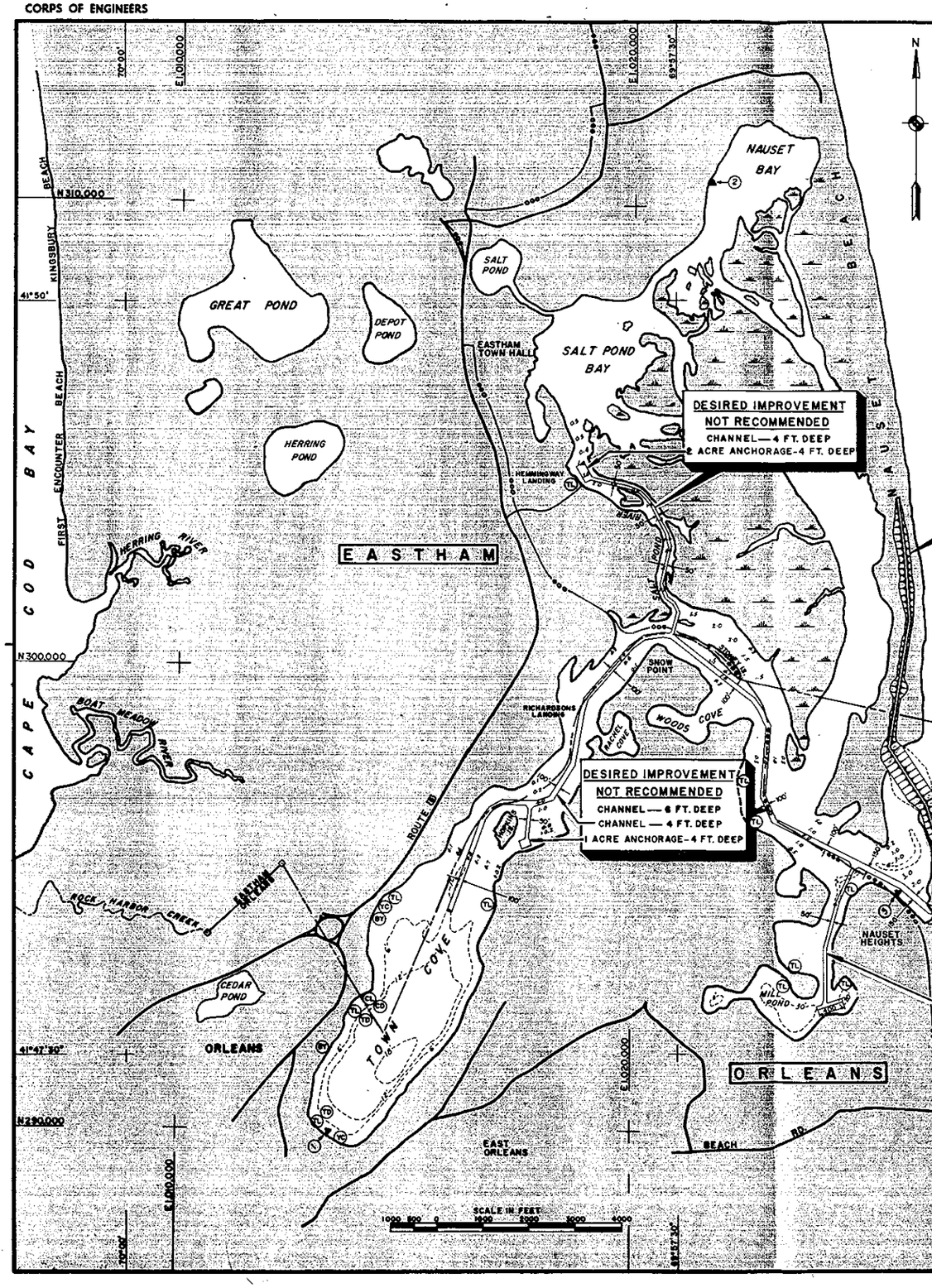
RECOMMENDATIONS

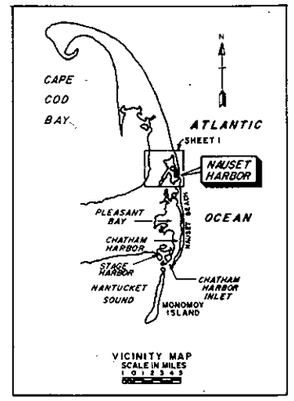
49. In view of the above, the Division Engineer recommends no Federal navigation improvements in Nauset Harbor at this time.

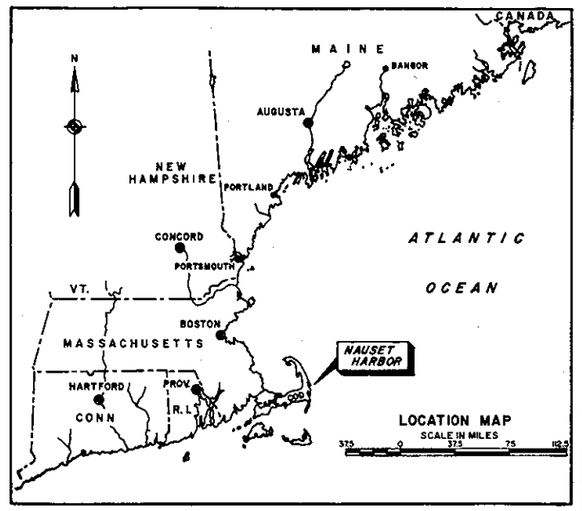
FRANK P. BANE
Colonel, Corps of Engineers
Division Engineer

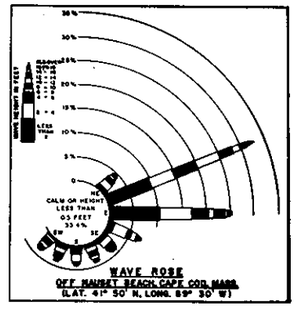
CORPS OF ENGINEERS

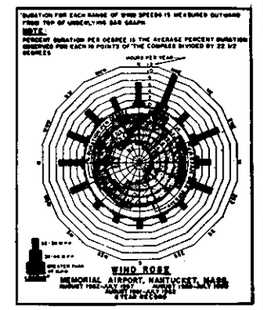
U. S. ARMY

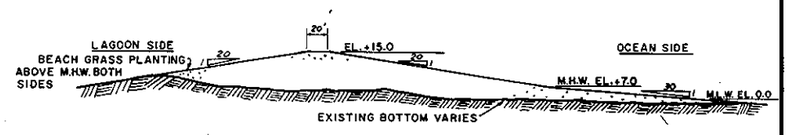












TYPICAL SAND DIKE SECTION

(NOT TO SCALE)

LEGEND

- (TL) TOWN LANDING
- (BY) BOAT YARD
- (YC) YACHT CLUB
- (CL) COMMERCIAL LANDING
- (CD) COMMERCIAL DOCK
- (TD) TOWN DOCK
- (1)→▲ AUTOMATIC TIDE GAUGE STA.
- ——●●●—— CAPE COD NATIONAL SEA SHORE BOUNDARY (FUTURE)
- SAND DIKE

SHADED AREA-EXTENSION OF CAPE COD NATIONAL SEASHORE (FUTURE)

NOTES:

Soundings are in feet and tenths and are referred to the plane of Mean Low Water.

Hydrography from U.S.C. & G.S. Chart No. 1208, Aerial photographs, and Orleans Harbormasters knowledge of the area.

Topography from U.S.G.S. Chart No. A.M.S. 6967 I SE Orleans, Mass.

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION
CORPS OF ENGINEERS
WALTHAM, MASS.

DR. BY	TR. BY	CK. BY
S.O.	A.D.C.	S.O.

SUBMITTED: PROJECT ENGINEER

CHIEF, COASTAL DEVELOPMENT SECT.

NAUSET HARBOR, MASS.
GENERAL MAP

APPROVED: CHIEF, ENGINEERING DIVISION

DATE: MARCH 1969

TO ACCOMPANY SURVEY REPORT DATED: JUNE 1969

SCALE AS SHOWN

DRAWING NUMBER Cm 71

SHEET 1 OF 1

PLATE NO. 1

APPENDIX A

SURVEY OF NAUSET HARBOR
ORLEANS AND EASTHAM, MASSACHUSETTS

ESTIMATE OF BENEFITS

1. The plan of improvement considered would provide some benefits to commercial and recreational boating interests. The benefits attributable to the considered plan of improvement are estimated below.

2. Commercial Fisheries. Benefits have been evaluated in terms of increased catch made possible by eliminating tidal delays, increasing the number of fishing days by constructing a stabilized inlet, and preservation of shellfish beds. Costs incurred in catching fish and lobster vary between 40 and 60 percent of the gross (or ex-vessel) value. The average costs for the size and type of boats using Nauset Harbor are estimated to be about 50 percent. A breakdown of each of the commercial fisheries benefits is as follows:

a. Lobster Fishery. The only full-time lobster fisherman in Nauset Harbor could increase his catch by about 25 percent as a result of improvement. The part-time lobstermen could increase their catch by 50 percent, for an average annual increase of 10, 700 pounds. No new lobster boats are anticipated due to the lack of terminal facilities, limited land available for docks and piers, and the lobster supply in the general area. The gross value would be about $8, 000, with the net annual benefit amounting to $4, 000. This benefit would be wholly general in nature.

b. Longline Fishing. The present longline fishermen will probably become party-boat operators, too, and will continue to fish for cod and other species on a part-time basis. The increased longline fish catch due to the navigation improvements is conservatively estimated to be an additional 15 percent, after completion of the project. The gross increase would be 25, 000 pounds for a value of $3, 800 and a net annual benefit of $1, 900. This benefit would be wholly general.

c. Shellfish (all kinds). The Conservation and Development Report of the U. S. Fish and Wildlife Service states that the considered plan of improvement would have only a minor and temporary effect on a small area of shellfish in Nauset Harbor. A copy of their report is included in APPENDIX B. The navigation improvements will reduce shoaling of shellfish beds and increase water quality within the harbor, thereby promoting shellfish growth. The Fish and Wildlife Service estimated that, after the proposed improvements in Pleasant Bay, with similar navigation improvements and barrier beach protection, the shellfish harvest would increase by 25 percent; therefore, it is estimated that the shellfish increase in Nauset Harbor would also be 25 percent, or about 450 bushels, for a total value of $5,400. Operating costs of shellfish boats and replacement of equipment is estimated at 25 percent of the gross value; therefore, the average annual benefit would be about $4,000.

The annual commercial fishing benefits accredited to the plan of improvement are summarized in TABLE A-I, on page A-6.

3. Recreational Boating. Benefits for both the existing and prospective recreational fleets have been evaluated as the gain in annual for hire return, which boat owners would enjoy, should improvements be made. Ideal return is expressed as a percentage of the average depreciated value of the boats comprising the fleets. It reflects ideal navigational conditions for the bay area and varies with the sizes and types of boats. In this report, ideal return varies from 14 percent for the popular size outboards to 7 percent for large cruisers and auxiliary sailboats. A new type of craft called "stern drives" is also included as they are becoming more popular and now comprise 4 to 5 percent of the recreational boats in a harbor. Present return is based on the navigational use which can be made in the improved areas. Both returns are expressed as percentage factors of the ideal return. The difference between the two represents the gain in use and is applied to the ideal return, in order to arrive at the gain in return resulting from the improvement. Navigation throughout Nauset Harbor for recreational boats drawing 2 feet is limited to periods of high water. Access to the Atlantic Ocean is prohibited to these boats, except at periods of very high and slack water. The more intrepid boatmen, in larger recreational type boats, occasionally navigate the existing inlet to the ocean, but only

under the most favorable conditions. Consequently, full use of the waterway area is denied to the entire recreational fleet. A breakdown of the benefits attributable to recreational aspects is as follows:

a. Existing Fleet. Providing a controlled inlet and interior navigation channels would make it possible for the existing fleet to navigate the waterways at all times, thereby allowing for increased and unrestricted use. The percentages of increased use for the various classes of existing boats have been computed and are shown in TABLE A-III. The annual benefits, in the amount of $12,600, being entirely recreational, have been classified as 50 percent general and 50 percent local in accordance with accepted practice.

b. Transferred Boats. It is anticipated that there will be about 10 transferred boats of the inboard type. Residents in Orleans having larger boats in other nearby harbors have stated that they would transfer boats to Nauset Harbor immediately after navigation improvements are completed. The annual benefits in the amount of $2,000 for transferred boats are shown in TABLE A-IV and are 50 percent general and 50 percent local.

c. Party Boat Fishing. Party boat fishing is gaining in popularity in the Cape Cod area, due to the increase in tourism and excellent fishing grounds in the contiguous Atlantic Ocean. Nauset Harbor is ideally located along the outer Cape and it is estimated that there would be five party boats transferring to Nauset Harbor immediately after the project is completed. Another five new and larger boats would be in operation 25 years after completion of the project, for a total of 10 party boats in Nauset Harbor. The party boats normally carry 6 to 8 people; however, some larger boats can carry up to about 15 people. The boats would probably make two runs per day during the tourist season, on a continuous operation, thereby serving a larger segment of the public. The transferred boats would come from other nearby ports and gain about 20 percent more use by transferring to an all-weather harbor. Continuous seasonal operation would increase their use by another 10 percent, for a total of 30 percent. Similar operation of the five new boats would amount to about 100 percent use of the navigation improvements. The present part-time cod fishermen in Nauset Harbor would probably be the owners and operators of the new

party boats, thereby replacing the small outboard motorboats they now use. During the off-season, the boats would be used on a part-time commercial basis, fishing for cod and other edible species. Ideal return for the party boats engaged in recreational fishing is estimated to be 15 percent. The party boat benefits attributable to the improvements are shown in TABLE A-V. The annual benefits in the amount of $12,200 have been classified as 50 percent general and 50 percent local.

d. New Boats. Recreational boating on Cape Cod is estimated to be increasing at the rate of about 8 percent annually, on a straight-line basis, in unrestricted navigational areas. It has been found that congestion and the inadequacy of the waterways, as well as the lack of anchorage space, preclude normal expansion of the existing recreational fleet in Nauset Harbor. Shoaled and shifting channels also discourage the growth of new, deeper draft boats. Some boats now encroach on certain sections of the natural channel into Town Cove and Salt Pond River, thereby endangering present users. For these reasons, recreational boating is presently increasing at only about 2 percent annually. With the considered plan of improvement, deepwater areas in Town Cove and Mill Pond would become accessible to all sizes of boats and additional space would be provided in the 2-acre anchorage in Salt Pond River, and the 1-acre anchorage east of Hopkins Island. This would eliminate the congestion in the main natural channel and also provide additional space for transient boats. TABLE A-II shows the anchorage capacities of existing and proposed areas and indicates that an additional 1,250 boats can be accommodated in those areas. It is anticipated that one new yacht club of at least 50 boats and one new 100-boat marina would be developed in Town Cove as a result of the considered plan. The yacht club would be built on private land and the marina would be an expansion of a private boatyard bordering Town Cove, but not presently developed as a marina. Both areas would require private dredging and would be self-liquidating. New channels would also allow larger craft to utilize the naturally deep areas in Town Cove and Mill Pond. Other coves and inlets in Nauset Harbor are too shallow or unusable for boats. Anchorages are needed in the designated areas as the existing boats are sometimes aground during low water periods. Of the approximately 28 miles of shoreline within the lagoon, including islands and marshes, about 18 miles are within the proposed extension of the Cape Cod National Seashore (CCNS). Since the area will

become a water-marsh conservation area, no navigational improvements will be undertaken within the CCNS boundaries. The remaining 10 miles will presumably continue to be used primarily for residential development and it is estimated that within 50 years there will be a total of about 264 lots, averaging 200 feet in frontage. Some owners would have one or more boats docked, moored, or anchored in front of their property. Assuming 1.5 boats per lot, about 396 new boats could be anticipated along the shoreline. Owners of homes on lots behind the shorefront and nearby housing developments who would have access to the harbor through public landings and rights-of-way would own about one-quarter more or another 99 for a total of 495 boats along the shoreline. Since there are already about 202 existing boats along the shoreline, there would be room for only another 293 new boats. The total estimated number of new, recreational boats in Nauset Harbor due to the improvements, exclusive of new boats in boat liveries, would be 1,250 + 50 +100 +293 = 1,693. Since the harbor area is relatively small, all the boats can be expected within 50 years, on a straight-line basis. The distribution and benefits, including a deduction for future growth without improvements (based on an expected 250 additional boats), is shown in TABLE A-VI. The annual benefits, being recreational, are classified as 50 percent general and 50 percent local.

e. Transient Boats. At present, transient boating in the waterways is sporadic. Virtually all transient boating is confined to trailer-drawn outboard motor craft, many from distant States. These boats are launched in the morning and return in early evening. Tidal conditions, however, reduce the length of trips by either delaying launchings or hastening returns. In addition, shoaled areas throughout the area severely limit their range. With improvement, these boats would enjoy full use of the waterways. Benefits were not estimated for the trailered boats as it is difficult to determine the number and amount of time the boats use the many launching ramps. Larger cruising type transient boats are practically non-existent in the harbor area due to the treacherous existing conditions at the inlet. In the town of Chatham, the harbormaster reported that, prior to the navigation improvement in Stage Harbor in early 1965, located 12 miles south, there were no sizable transient craft of any type, due to similar shoaling conditions at the old entrance to Stage Harbor. Since the improvement, the harbor has been extensively used by transient recreational craft, especially throughout the summer season.

Recreational boats, 30 to 50 feet in length, frequently anchor in the harbor for a week or more, cruising Nantucket Sound during the day and returning at night. Some boats stay over only on weekends, returning many times during the season. Numerous smaller craft spend the day in the harbor and return to nearby home ports at night. With the proposed navigational improvements in the Nauset Harbor area, a large seasonal transient fleet is expected to utilize the existing and future facilities. In addition, it is anticipated that the area would become a port-of-call for a large number of boats that seasonally cruise the Atlantic Ocean. The number of transient boats in the Nauset Harbor area on any one day is estimated to be about 25, for a total of 3, 250 boating days. This amounts to 25 permanently based boats of various sizes. Benefits in the amount of $6, 000 for these boats are shown in TABLE A-VII and are considered 50 percent general and 50 percent local.

TABLE A-I

SUMMARY OF ANNUAL BENEFITS

Source	General	Local	Total
Commercial Fishing			
Lobster Fishing	$ 4, 000	-	$ 4, 000
Longline Fishing	1, 900	-	1, 900
Shellfishing	4, 000	-	4, 000
	$ 9, 900	0	$ 9, 900
Recreational Boating			
Existing Fleet	$ 7, 300	$ 7, 300	$ 14, 600
Transferred Boats	1, 000	1, 000	2, 000
Party Boats	6, 100	6, 100	12, 200
New Boats	93, 000	93, 000	186, 000
Transient Boats	3, 300	3, 300	6, 600
	$110, 700	$110, 700	$221, 400
TOTALS	$120, 600	$110, 700	$231, 300
PERCENTAGE	52. 2	47. 8	100

TABLE A-II - ANCHORAGE CAPACITIES

EXISTING

	Total Surface Area (acres)	Surface Area over 6 ft. deep (MLW) (acres)	Area Available for Anchoring Boats (acres)	No. of Possible Boats at 12 per acre	No. of Existing Boats Anchored	Possible Increase at 12 per acre
Town Cove	464.0	176.0	100.0	1,200	130	1,070
Mill Pond	45.9	22.9	17.2	206	43	163
			Sub-Total	1,406	173	1,233

PROPOSED

	Total Surface Area (acres)	New Surface Area over 4 ft. deep (MLW) (acres)	Area Available for Anchoring Boats (acres)	No. of Possible Boats at 20 per acre	No. of Existing Boats Anchored	Possible Increase at 20 per acre
Hopkins Island (new)	-	1.0	0.75	15	8	7
Hemingway Landing (new)	-	2.0	1.50	30	20	10
			Sub-Total	45	28	17
			TOTAL	1,451	201	1,250

TABLE A-III - BENEFITS TO RECREATIONAL BOATING

Existing Local Fleet

NAUSET HARBOR — 130 DAY SEASON

TYPE OF CRAFT	LENGTH (feet)	No. of BOATS	DEPRECIATED VALUE AVERAGE $	DEPRECIATED VALUE TOTAL $	PERCENT RETURN Ideal	% of Ideal Pres.	% of Ideal Fut.	Gain	VALUE ON CRUISE $	Avg. Days	% of Season	Value $
RECREATIONAL FLEET												
Outboards	15-20	286	1,400	400,000	14	80	100	2.8	11,200	-	-	-
Inboards	15-20	23	2,600	59,800	12	80	100	2.4	1,500	-	-	-
	21-30	4	4,300	17,200	11	70	100	3.3	600	-	-	-
	31&Up	-	-	-	-	-	-	-	-	-	-	-
Sterndrive	15-20	2	2,500	5,000	12	80	100	2.4	120	-	-	-
Sailboats	8-15	68	500	34,000	12	90	100	1.2	400	-	-	-
	16-20	21	1,200	25,200	12	75	100	3.0	760	-	-	-
TOTALS		404		541,200					14,580			

ANNUAL BENEFIT - SAY $14,600

TABLE A-IV - BENEFITS TO RECREATIONAL BOATING

Transferred Boats
(Immediately After Improvements)

NAUSET HARBOR — 130 DAY SEASON

TYPE OF CRAFT	LENGTH (feet)	No. of BOATS	DEPRECIATED VALUE AVERAGE $	DEPRECIATED VALUE TOTAL $	PERCENT RETURN Ideal	% of Ideal Pres.	% of Ideal Fut.	Gain	VALUE ON CRUISE $	Avg. Days	% of Season	Value $
RECREATIONAL FLEET												
Inboards	15-20	1	2,600	2,600	12	80	100	2.4	60	-	-	-
	21-30	2	4,300	8,600	11	80	100	2.2	190	-	-	-
	31&Up	2	16,000	32,000	10	75	100	2.5	800	-	-	-
Cruisers	21-30	3	6,500	19,500	9	80	100	1.8	350	-	-	-
	31-40	2	16,000	32,000	8	75	100	2.0	640	-	-	-
TOTALS		10		94,700					2,040			

ANNUAL BENEFIT $2,040

SAY $2,000

TABLE A-V - BENEFITS TO RECREATIONAL BOATING

Party Fishing Boats

NAUSET HARBOR — 130 DAY SEASON

TYPE OF CRAFT	LENGTH (feet)	No. of BOATS	DEPRECIATED VALUE AVERAGE $	DEPRECIATED VALUE TOTAL $	PERCENT RETURN Ideal	% of Ideal Pres.	% of Ideal Fut.	Gain	VALUE ON CRUISE $	ON CRUISE Avg. Days	ON CRUISE % of Season	ON CRUISE Value $
TRANSFERS (Immediately After Improvement)												
Inboards	31-40	5	16,400	82,000	15	70	100	4.5	3,700	-	-	-
									ANNUAL BENEFITS =			$ 3,700
NEW BOATS ADDED (Max. Growth in 25 Years)												
Inboards	31-40	5	20,000	100,000	15	0	100	15.0	15,000	-	-	-
				$15,000 x 0.5678 = $8,500								
									ANNUAL BENEFITS =			$ 8,500
TOTALS		10		$267,500					ANNUAL BENEFITS =			$12,200

TABLE A-VI - BENEFITS TO RECREATIONAL BOATING

New Boats Added

NAUSET HARBOR — 130 DAY SEASON

TYPE OF CRAFT	LENGTH (feet)	No. of BOATS	DEPRECIATED VALUE AVERAGE $	DEPRECIATED VALUE TOTAL $	PERCENT RETURN Ideal	% of Ideal Pres.	% of Ideal Fut.	Gain	VALUE ON CRUISE $	Avg. Days	% of Season	Value $
RECREATIONAL FLEET												
Outboards	15-20	830	1,400	1,160,000	14	0	100	14	162,000	-	-	-
Inboards	15-20	64	2,600	166,000	12	0	100	12	20,000	-	-	-
	21-30	48	4,300	206,000	11	0	100	11	22,600	-	-	-
	31&Up	16	16,000	256,000	10	0	100	10	25,600	-	-	-
Sterndrive	15-20	80	2,500	200,000	12	0	100	12	24,000	-	-	-
	21-25	64	4,500	288,000	11	0	100	11	31,600	-	-	-
	26&Up	32	9,800	314,000	10	0	100	10	31,400			
Cruisers	21-30	150	6,500	975,000	9	0	100	9	88,000	12	11	9,800
	31-40	60	16,000	960,000	8	0	100	8	77,000	16	20	15,400
	41-50	18	40,000	720,000	8	0	100	8	57,700	24	18	10,400
	51&Up	10	76,000	760,000	7	0	100	7	53,100	36	28	14,900
Aux. Sail	15-20	25	1,800	45,000	9	0	100	9	4,000	-	-	-
	21-30	32	4,900	156,000	8	0	100	8	12,500	6	5	600
	31-40	32	14,400	460,000	8	0	100	8	36,800	16	12	4,400
	41&Up	16	30,000	480,000	7	0	100	7	33,600	20	15	5,000
Sailboats	8-15	100	500	50,000	12	0	100	12	6,000	-	-	-
	16-20	50	1,200	60,000	12	0	100	12	7,200	-	-	-
	21-25	48	2,100	101,000	11	0	100	11	11,100	6	5	600
	26&Up	17	3,500	60,000	10	0	100	10	6,000	16	12	700
TOTALS		1,692		$7,417,000					($710,200 = $648,400	-		$61,800)

New Boats with Improvement ($648,400 x 0.336) = $218,000

New Boats Growth without Improvement = - 32,000

ANNUAL BENEFIT = $186,000

TABLE A-VII - BENEFITS TO RECREATIONAL BOATING

Transient Boats (Equivalent)

NAUSET HARBOR — 130 DAY SEASON

TYPE OF CRAFT	LENGTH (feet)	No. of BOATS	DEPRECIATED VALUE AVERAGE $	DEPRECIATED VALUE TOTAL $	PERCENT RETURN Ideal	% of Ideal Pres.	% of Ideal Fut.	Gain	VALUE $
RECREATIONAL FLEET									
Outboards	15-20	1	1,400	1,400	14	90	100	1.4	20
Inboards	15-20	1	2,600	2,600	12	90	100	1.2	30
	21-30	2	4,300	8,600	11	80	100	2.2	190
	31&Up	2	16,000	32,000	10	80	100	2.0	640
Sterndrive	15-20	1	2,500	2,500	12	90	100	1.2	30
	21-25	2	4,500	9,000	11	80	100	2.2	200
Cruisers	21-30	1	6,500	6,500	9	90	100	0.9	60
	31-40	2	16,000	32,000	8	80	100	1.6	510
	41-50	1	40,000	40,000	8	80	100	1.6	640
	51&Up	2	76,000	153,000	7	75	100	1.8	2,750
Aux. Sail	15-20	1	1,800	1,800	9	90	100	0.9	20
	21-30	1	4,900	4,900	8	80	100	1.6	80
	31-40	1	14,400	14,400	8	80	100	1.6	230
	41&Up	2	30,000	60,000	7	75	100	1.8	1,080
Sailboats	8-15	1	500	500	12	90	100	1.2	10
	16-20	1	1,200	1,200	12	90	100	1.2	20
	21-25	1	2,100	2,100	11	80	100	1.1	20
	26&Up	2	3,500	3,500	10	75	100	2.5	90
TOTALS		25							$6,620

ANNUAL BENEFIT = $6,620

SAY $6,600

APPENDIX B

COMMENTS OF FEDERAL, STATE AND TOWN OFFICIALS

SURVEY OF NAUSET HARBOR,

ORLEANS AND EASTHAM, MASSACHUSETTS

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF OUTDOOR RECREATION
128 N. BROAD STREET
PHILADELPHIA, PENNSYLVANIA 19102

Your ref:
NEDED-R

IN REPLY REFER TO:
D64

August 12, 1968

Colonel Remi O. Renier
Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Colonel Renier:

In reply to your letter of July 12, 1968, requesting information relative to this Bureau's interest in the investigation of navigation improvement at Nauset Harbor, Massachusetts for the purpose of a public hearing to be held August 15, 1968, we offer the following information.

The area to be investigated at the public hearing lies within the Cape Cod National Seashore. Since the Seashore is administered by the National Park Service, we believe that agency should have primary responsibility for the development of reports and plans for obtaining optimum recreation benefits from any improvements found appropriate for the area. We will be interested in working with you, the National Park Service and other Federal, State or local agencies toward this end.

The Bureau's interest in the Nauset Harbor area stems from the fact that the area under investigation lies in the heart of a nationally significant recreation area - Cape Cod National Seashore. A portion of the area to be explored lies within the purchase boundary of the Seashore. We understand that the bays, coves and harbors in this area also support recreation boating to some extent. The primary boating area along this part of the coast is Pleasant Bay, south of Nauset Harbor.

It is important that the unique ecological communities supported by the wetlands bounded by Nauset Bay, Salt Pond Bay, Nauset Harbor and Nauset Bay be protected from all forms of encroachment including that of spoil deposition. We anticipate that these wetlands will eventually become a part of the Seashore proper. They will then serve as a living nature laboratory for the enjoyment and education of Seashore visitors.

Unfortunately we will not be able to attend the public hearing. By copy of this letter, we are forwarding the Notice of Public Hearing and our comments to Mr. Robert Yasi, our State Liaison Officer in Massachusetts, and to Mr. Stanley C. Joseph, Superintendent, Cape Cod National Seashore, South Wellfleet, Massachusetts. We understand that Mr. Joseph will be represented at the hearing.

Sincerely yours,

Rolland B. Handley
Regional Director

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
U. S. POST OFFICE AND COURTHOUSE
BOSTON, MASSACHUSETTS 02109

January 10, 1969

Division Engineer
New England Division
U. S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Sir:

This is our conservation and development report on the navigation study of Nauset Harbor, Orleans and Eastham (Barnstable County), Massachusetts, which you are making under authority of Section 109 of the River and Harbor Act approved July 14, 1960 (Title I Public Law 86-645). This report was prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-666 inc.), in cooperation with the Massachusetts Division of Marine Fisheries and Massachusetts Division of Fisheries and Game and has their concurrence as indicated by letters dated December 19 and 27, 1968, respectively. The report has also been coordinated with and represents the views of the Bureau of Commercial Fisheries.

Our July 12, 1966 preliminary report on this study advised you of the valuable fish and wildlife values in the Nauset area and recommended that no spoil material be placed on marshes or wetlands. This recommendation is still applicable.

We understand that your studies indicate that there is not sufficient economic justification for a project at the present time. Consideration was given to a stabilized inlet and channel and anchorage improvements within the harbor. If any improvements for Nauset Harbor are considered in the future, however, we would appreciate being advised in sufficient time to prepare a report.

Sincerely yours,

Richard E Griffith

Regional Director

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
U.S. POST OFFICE AND COURTHOUSE
BOSTON, MASSACHUSETTS 02109

July 12, 1966

Division Engineer
New England Division
U.S. Army Corps of Engineers
424 Trapelo Road
Waltham, Massachusetts 02154

Dear Sir:

This constitutes our preliminary fish and wildlife report on the navigation improvements project for Nauset Harbor, Orleans and Eastham, Barnstable County, Massachusetts, which you are presently studying under authority of the River and Harbor Act approved July 14, 1960. This report was prepared under authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-666 inc.), in cooperation with the Massachusetts Division of Marine Fisheries and Division of Fisheries and Game and has their concurrence as indicated by letters dated June 23, 1966 and June 28, 1966, respectively.

It is our understanding that navigational improvements to be considered may include stabilization of the inlet and deepening a small anchorage area inside the inlet. Shoaling problems in this harbor and inlet are caused by littoral beach drift. A portion of the Cape Cod National Seashore could become involved in this project since the Seashore property take line runs generally up the middle of Nauset Harbor to include the large unspoiled salt marsh complex north of Nauset Harbor. This large Nauset marsh complex is being managed primarily as a conservation area within the bounds of the Cape Cod National Seashore.

The Nauset Harbor and Town Cove area is primarily used by recreational boaters summering in this heavily-developed Orleans area.

The Nauset Harbor-Town Cover complex supports a significant finfish resource. An excellent sport fishery is supported by several species, the most important of which are summer flounder, winter flounder, striped bass, bluefish, and tautog. Although found in lesser numbers in the project area and adjacent

waters, species such as black sea bass, bonito, Atlantic cod, northern kingfish, Atlantic mackerel, pollock, scup, American shad, American smelt, Atlantic tomcod, and white perch are sufficiently abundant to contribute significantly to the excellent sport fishery. In addition to these waters being important for their sport fishery they also serve as an important spawning and/or nursery area for many species of sport and commercial finfish as well as many species of bait fish.

This large shoal water-marsh complex is particularly important because of the existence of an extensive lobster nursery area. Because of the very large numbers of small lobsters found in these sheltered waters the area is considered most unusual. In addition to these shoal waters possessing highly significant values for lobsters they also provide excellent habitat for large quantities of highly valued soft clams and lesser quantities of hard clams (quahogs). Periodically, the area also produces significant quantities of scallops. These shellfish are distributed generally throughout most of the area but are found in greatest numbers in Town Cove and in the channel area leading into Town Cove from Nauset Harbor. Also important for its shellfish production is the northerly portion of the adjacent Nauset marsh. The more easterly portion of Nauset Harbor, generally the main channel area in the Nauset Heights area, is not an important shellfish production area because of the unfavorable bottom habitat due to the constant shifting of sands by strong tidal currents. Soft-shelled clams are found in commercial quantities and Town Cove produced clams valued at $8,000 in 1964. No commercial fishing vessels operate out of Nauset Harbor. However, one full-time lobsterman operates out of the adjacent Town Cove Harbor. Moored here also are a few shallow draft boats owned by shellfish bull-rake operators.

This entire water-marsh complex protected by the barrier beach is important for its waterfowl use. The large marsh area lying adjacent to and north of Nauset Harbor contributes very significantly to the overall attractiveness and high values of the area for waterfowl. Heavy use is made of the area during the migration periods and large numbers of waterfowl winter in these waters. Waterfowl hunter use is not particularly heavy although hunting opportunities are good.

Locating and dredging an anchorage area in the easterly or lower portion of Nauset Harbor, generally in the area of Nauset Heights, would do very little damage to the fish and wildlife resources. Deepening and stabilizing the channel through the inlet into the harbor would not cause any damages to these resources provided the interchange of water through the inlet remains relatively unchanged. Should this interchange be upset significantly, detrimental biolog-

ical changes could result throughout this shoal water-salt marsh habitat. Significant changes in water interchange could very well cause the loss of this highly important lobster nursery area.

Silting resulting from dredging could detrimentally affect the lobster and shellfish resource during certain periods of the year. A determination would have to be made as to when these resources would be least vulnerable to the effects of silting.

Jetties may be considered as one of the improvement features in stabilizing the inlet. Should jetties be included in the plan they would be valuable in providing additional fishing opportunities for the land-based fisherman. However, to provide maximum benefits these jetties would have to be smooth-capped to provide safe and easy walking for fishermen. Adequate access to the jetties would also be necessary. A single safety rail might also be desirable along the top of the jetties.

Should the small-boat channel from Nauset Harbor to Town Cove be modified, some temporary shellfish losses would result through construction. It is felt, however, that shellfish would quickly re-establish themselves throughout the channel construction area. A shoal channel of uniform depth with gently sloping sides would allow for harvesting following re-establishment of shellfish. Finfish would not be significantly affected by anchorage dredging or small-boat channel work.

Under no circumstances should spoil be deposited on any of the marsh islands or shoal waterways north of the Nauset Harbor area nor should any of the shellfish-producing areas in Town Cove or Nauset Harbor be spoiled upon. Spoiling on the adjacent beaches or on upland areas would be acceptable from a fish and wildlife standpoint. Any spoiling within the confines of the Cape Cod Seashore should be coordinated with the National Park Service so that aesthetic and other recreational aspects can be taken into account.

If harbor and anchorage facilities of major proportions should be developed in the Nauset Harbor-Town Cove area, that is, development of the size that would attract considerable numbers of the larger size pleasure cruisers, we could expect a pollution problem to develop. With but one small outlet to the open sea serving this very large complex of open water and marsh islands, pollution emanating from these boats would build up rather rapidly since the major portion of these pollutants would probably not be flushed from this area. Consequences of a serious nature could result to the fish and wildlife resources, to the overall aesthetics of Nauset Harbor, Town Cove, and the large salt marsh complex within the Cape Cod National Seashore, as well as to the overall water-oriented

recreational aspects of the area.

The project would not benefit the commercial fishery.

It is recommended:

1. That no spoil be deposited on the Nauset marshes, mud flats or in any waters inside the inlet.

2. That spoil be deposited on nearby beaches or upland areas or on an approved dumping ground at sea.

3. That, should jetties become a project feature, they be constructed for land-based sport fisherman use.

It is the opinion of this Service and the cooperating fish and wildlife agencies that we may need to undertake the following investigations to enable us to prepare a report advising you of the effect of your plans upon fish and wildlife resources.

1. Prepare detailed maps and biological evaluations of the Nauset Harbor-Nauset Marsh-Town Cove complex of significant value to fish and wildlife.

2. Determine measures needed to avoid or to mitigate damages to fish and wildlife resources which may be caused by project construction.

3. Determine locations where improvements can be made for fishing and hunting access in connection with project features.

4. Determine periods of the year when dredging activities would be least damaging to fish and wildlife.

5. Evaluate benefits and losses to fish and wildlife resources that would result from project construction.

6. Assist in locating areas suitable for spoil disposal which would be least harmful to fish and wildlife or where spoiling would improve these resources.

7. Determine the need and feasibility for further project-related measures which would benefit fish and wildlife resources.

We plan to prepare a conservation and development report which will appraise the effects of your plan of improvement upon fish and wildlife resources. The report will provide you with information about project-occasioned losses or incidental benefits, and a determination of enhancement benefits resulting from such measures as may be adopted for improvement of fish and wildlife resources. These studies will be carried out in cooperation with the Massachusetts Division of Fisheries and Game and the Massachusetts Division of Marine Fisheries.

Sincerely yours,

Thomas G. Schrader

Acting Regional Director
Bureau of Sport Fisheries & Wildlife

John T. Pharrett

Regional Director
Bureau of Commercial Fisheries

APPENDIX B

Town of Eastham

BOARD OF SELECTMEN
BOARD OF ASSESSORS

BOARD OF HEALTH
BOARD OF WELFARE

Eastham, Massachusetts

June 9, 1969

Colonel Frank P. Bane
Division Engineer
New England Division, Corps of Engineers
424 Trapelo Road
Waltham, Mass. 02154

Dear Colonel Bane:

On June 2, 1969, we were informed of the results of the Nauset Harbor navigation study, authorized by Section 109 of the River and Harbor Act of 1960, by members of your staff.

We understand that the benefit-cost ratio of 0.2 indicates that navigation improvements cannot be economically justified and no improvements will be recommended in Nauset Harbor at this time.

The Board of Selectmen concur with the findings and express our thanks to the corps of Engineers for undertaking the study.

Sincerely yours,

Luther P. Smith, Chairman

Prescott B. Cummings

Fred G. LaPiana, Jr.

Board of Selectmen

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SURVEY REPORT OF NAUSET HARBOR, ORLEANS AND EASTHAM, MASSACHUSETTS

Information Required by Senate Resolution 148, 85th Congress, Adopted 28 January 1958

1. Navigation Problems. Nauset Harbor is a tidal lagoon on the east side of the "forearm" of Cape Cod, located within the towns of Orleans and Eastham, Massachusetts. The uncontrolled natural inlet into the harbor is continually shoaling and shifting, with almost every change in tide. Breaking waves in the shallow inlet make passage hazardous to both commercial and recreational boating, especially at low water. Offshore storms create waves that overtop the barrier beach and carry large quantities of sand into the lagoon, filling natural navigation channels and also covering shellfish beds and marshes. Tidal currents transport huge volumes of suspended material through the inlet, deep into the harbor and connecting waterways, filling existing navigation channels and restricting boating use.

2. Considered Improvements. The study included all the desires and needs of local interests as well as others deemed necessary for a safe project that would adequately support the present and future needs of Nauset Harbor. A plan of improvement incorporating all of the above was developed which would involve (a) a stabilized inlet protected by jetties, (b) a 15-foot channel extending from deep water into the harbor and thence channels 6 feet deep extending into Town Cove, Mill Pond, Salt Pond River, and the area east of Hopkins Island, and (c) a 2-acre anchorage in Salt Pond River and a 1-acre anchorage east of Hopkins Island.

3. The estimated total first cost for the proposed plan of improvement is $8,100,000, including $30,000 for aids to navigation and $10,000 for two public landings. Annual charges would be $932,000 and annual benefits $231,300 resulting in a benefit-cost ratio of 0.2 to 1.0.

4. Discussion. The navigation study revealed the inadequacy of the harbor and connecting waterways for existing and prospective commercial and recreational boating. The considered plan of improvement would meet the needs of the present and future fleets, but the estimated cost exceeds the estimated benefits and the project is not economically justified. Therefore, the Division Engineer recommends that no Federal navigation improvement in Nauset Harbor be undertaken at this time.